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EXAMINER
SUMMONS, BARBARA

ART UNIT	PAPER NUMBER
2817	

DATE MAILED: 05/21/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
10/082,054	Endo et al.
Examiner	**Group Art Unit**
Barbara Summons	2817

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 (three) MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

☒ Responsive to communication(s) filed on 2/26/02 (Pre Amdt A)

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-14 is/are pending in the application.

Of the above claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-10, 13 and 14 is/are rejected.

☒ Claim(s) 11 and 12 is/are objected to.

☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☒ The drawing(s) filed on 2/26/02 is/are objected to by the Examiner

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)-(d).

☒ All ☐ Some* ☐ None of the:

☒ Certified copies of the priority documents have been received.

☐ Certified copies of the priority documents have been received in Application No. _____.

☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____.

Attachment(s)

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 4

☐ Interview Summary, PTO-413

☒ Notice of Reference(s) Cited, PTO-892

☐ Notice of Informal Patent Application, PTO-152

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Other _____

Office Action Summary

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "206" has been used to designate both a "common electrode" as shown in Figs. 7, 16, and 20 (see pg. 15, lns. 9-10), and an output side "IDT" shown in Fig. 14 (see pg. 14, lns. 13-15). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "102" has been used to designate both a "counter second interdigital electrode finger" as shown in Figs. 3, 7 and 9 (see pg. 8, lns. 3-6) and one of "two input IDTs" as shown in Figs. 11, 13, 14, 15, 16, 17, 18, 19 and 20 (see pg. 12, ln. 15). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated (see e.g. pg. 5, lns. 6-8 and pg. 1, lns. 18-25). See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claims 3, 9 and 10 are objected to because of the following informalities:

In claim 3, on lines 3-4, for clarity, the Examiner suggests the claim be rewritten from the point starting with "a position" as follows:

--(a) relative positions of the electrode fingers at a side of connecting with the corresponding balanced terminals are (is) mutually slid in half-wavelengths.--

(See e.g. the specification at page 8, lines 17-20). The above is a suggestion only, and any other clear terminology is acceptable.

In claim 9, on line 2, it appears that "the filters are" should correctly be --the device is-- as referenced in line 1, and also because "the filters" lacks antecedent basis in the claim.

Similarly, in claim 10, on line 2, "the filters are" should be --the device is--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

6. Claims 1-3 and 8-10 are rejected under 35 U.S.C. § 102(b) as being anticipated by Kondo et al. JP 2000-91883 (cited by Applicants).

Fig. 3 of Kondo et al. discloses a surface acoustic wave (SAW) device (i.e. filter 1b) comprising: an input interdigital transducer (IDT)[2b, 5b and 6b], and an output IDT [3b and 4b], wherein the input IDTs are those of the "first type", and the output IDTs are those of the "second type" as recited in claim 2; wherein the IDTs are disposed in a SAW propagation path along arrow 1b on a piezoelectric substrate (not shown, see section [0016] of the attached machine translation); wherein an electrode finger overlap aperture length of the input/first type IDTs [2b, 5b and 6b] is X, and the output/second type IDTs [3b and 4b] are divided into two IDTs each having an aperture length of X/2 (see the sentence bridging pages 2 and 3 of the machine translation); and wherein the input/first type IDTs [2b, 5b and 6b] are connected to an unbalanced input terminal (i.e. coming from the output IDTs 2a, 5a and 6a of unbalanced filter 1a with unbalanced inputs 13a and 14a and outputs); wherein the output/second type two divided IDTs are serial-connected (ibid.); and wherein the electrodes led from the two divided IDTs are disposed so that two output signals [see output pads 9b-12b] connected to a balanced terminal pair [13b and 14b] have a phase difference of 180 degrees (i.e. by the definition of "balanced" terminals).

Regarding claim 3, in the two divided IDTs (e.g. 3b) a position of the finger connected to pad 11b and terminal 13b is a half wavelength closer to the IDTs 2b and 5b on both of its sides than the fingers connected to pad 9b and terminal 14b. Regarding claim 8, there are five IDTs. Regarding claims 9 and 10, two filters 1a and 1b are cascaded with the "outermost" filter being filter 1b.

7. Claims 1-7, 9 and 10 are rejected under 35 U.S.C. §§ 102(b) and 102(e) as being anticipated by Baier et al. WO 98/57429 and its equivalent U.S. 6,353,372, respectively.

The following discussion will reference the U.S. document.

Baier et al. discloses a SAW three IDT/double mode filter (Applicants' claim 7) device (see Fig. 7 and col. 1, lns. 14-16) in which the input or output IDTs W20 and W21 are replaced by the structures shown in Figs. 1-6 so that the input impedance will be different from the output impedance (see col. 1, lns. 61-66 and col. 2, lns. 1-6). By replacing the input IDT W20 of Fig. 7 with the IDT structure of Fig. 3, Baier et al. discloses a SAW device with output IDTs 3 of a "first type" with an electrode finger overlap aperture length X, and an input IDT W20 of a "second type" split into two IDTs W1 and W2 (Fig. 3), wherein divided IDTs W1 and W2 are serial-connected (col. 3, lns. 10-11) and inherently must have an aperture of X/2 because the impedance is increased by a factor of four (see col. 3, lns. 13-14); and wherein the two divided IDTs W1 and W2 are arranged so that two input signals connected to a balanced input terminal pair (Inputs in Fig. 3) have a phase difference of 180° (i.e. by definition of "balanced" terminals).

Regarding claim 2, although not particularly shown in the figures, the device is disclosed to have a balun function (see col. 1, lns. 62-64), in which case the upper filter in Fig. 7 may be unbalanced providing an unbalanced input terminal pair to the lower filter which would have a split output IDT of Fig. 3 in place of output IDT W21. In other words, Baier et al.'s disclosure of the balun function provides the same structure as discussed in the previous rejection, only with three IDTs rather than five, and provides the same structure as Applicants' Fig. 19.

Regarding claim 3, as can be seen in Fig. 3, the electrode fingers connected to the upper input terminal and extending downward in the figure, are slid a half wavelength relative to the electrode fingers connected to the lower input terminal and extending upward in the figure (i.e. the width of fingers and spaces being a quarter wavelength). Regarding claims 4-6, Baier et al. discloses the connection part 1 (Fig. 3) of the divided IDTs be connected to ground (see col. 3, lns. 15-16). Regarding claims 9 and 10, the device is formed by cascade connecting two SAW filters (Fig. 7) wherein one or both of the "outermost" filters (i.e. input or output filters in the case of more than two filters) have the structure with an input or output IDT of Fig. 3 connected to a balanced terminal.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 13 and 14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over any one of Kondo et al. JP 2000-91883 (cited by Applicants) or Baier et al. WO 98/57429 and its equivalent U.S. 6,353,372 in view of Ueda et al. JP 9-167936 (cited by Applicants) or its U.S. equivalent U.S. 6,037,847.

Each of Kondo et al. and Baier et al. discloses the invention as discussed above, except for disclosing the piezoelectric substrate to be the recited cuts of $LiTaO_3$ or $LiNbO_3$.

The discussion of Ueda et al. will reference the U.S. document. Ueda et al. discloses that piezoelectric substrates of 40° to 44° rotated Y-X $LiTaO_3$ and 66° to 74° rotated Y-X $LiNbO_3$ are advantageous over conventional cuts of $LiTaO_3$ and $LiNbO_3$ (see e.g. all of cols. 1 and 2) because they provide minimized SAW propagation loss and wide bandwidth filters (see e.g. col. 3, lns. 53-62 and col. 4, lns. 32-41).

Consequently, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the SAW devices of any of Kondo et al. (Fig. 3) and Baier et al. (Fig. 7 with Fig. 3) by replacing their conventional cut piezoelectric substrates with either

one of 40° to 44° rotated Y-X $LiTaO_3$ and 66° to 74° rotated Y-X $LiNbO_3$, because such an obvious modification would have been the mere substitution of art recognized alternate piezoelectric substrates, and because these specific cut angles of the substrates would have provided the advantageous benefits of minimized SAW propagation loss, a wide bandwidth, and good filter shape factor as suggested by Ueda et al. (ibid.).

10. Claims 4-6 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kondo et al. JP 2000-91883 (cited by Applicants) in view of Baier et al. WO 98/57429 or its U.S. equivalent U.S. 6,353,372 (U.S. '372).

Kondo et al. discloses the invention as discussed above, except for explicitly disclosing the common connection part of the two divided IDTs being connected to ground.

Baier et al. explicitly discloses that the common connection of the divided IDTs be "either grounded or floated, depending upon the requirement" (see U.S. '372 at col. 3, lns. 15-16 and Fig. 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the SAW device of Kondo et al. (Fig.3), if even necessary, such that the common connectors of the divided IDTs (3b and 4b) would have been grounded, because such an obvious modification would have been dependent upon specific design requirements as explicitly suggested by Baier et al. (see U.S. '372 at col. 3, lns. 15-16).

Allowable Subject Matter

11. Claims 11 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record does not disclose or fairly suggest a SAW device comprising each of the specifically recited features and especially wherein with two or more cascaded filters having a plurality of connection parts between the IDTs of the filters, "a phase of the filter is reversed in each neighboring connection part..." (see claims 11 and 12). The structure for accomplishing this is shown in Applicants' Fig. 16 where the closest electrodes of neighboring IDTs 101 and 104 are signal/ground connected, respectively, but the closest electrodes of neighboring IDTs 101 and 103 are ground/ground connected, respectively. This is not shown or suggested as being combined with a divided IDT in either Kondo et al. or Baier et al. or any other art of record.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Mita et al. JP 2001-292050 discloses (see the entire abstract) a balanced/unbalanced SAW filter device with IDTs split into two IDTs evenly or unevenly (Figs. 1, 5, 8 and 10 show evenly

split IDTs), and shows adding resonators in ladder form (see Fig. 11). The earliest publication date of this document does not precede Applicants' earliest effective filing date. However, it is not clear from the application what material is the "CIP" added material, i.e., what material is not entitled to the filing date of PCT/JP01/05677.

Taguchi et al. U.S. 5,936,488 and its Japanese equivalent JP 9-205342, included for Applicants' convenience, disclose a SAW device with an IDT structure for providing balanced/unbalanced conversion and differing input/output impedances (see the abstract).

Matsui et al. JP 10-173470 discloses a SAW device with a divided IDT structure (see e.g. Fig. 1) for providing differing input/output impedances (see the abstract).

Morishita et al. U.S. 4,425,554 discloses (Fig. 4) a SAW filter with a divided IDT similar to Applicants' Fig. 3, without specifically disclosing balanced to unbalanced conversion (see col. 5, lns. 11-25).

14. Any inquiry concerning this communication should be directed to Barbara Summons at telephone number (703) 308-4947, FAX no. (703) 308-7724, receptionist's no. (703) 308-0956, Supervisory Examiner Bob Pascal (703) 308-4909.

Barbara Summons

Barbara Summons
Primary Examiner
Art Unit 2817

bs
May 14, 2003
(1 attachment)

* NOTICES * Attachment 1 : Machine Translation of JP 2000-91883 (cited by Applicant)

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the highly efficient and small surface-acoustic-wave filter used for a surface-acoustic-wave filter especially a radio machine, a resonator, etc.
[0002]
[Description of the Prior Art] As a surface-acoustic-wave filter used for mobile communications etc , the technology of a publication etc. is well-known to JP,57-202114,A, and it excels in high performance and the miniaturization. The conventional surface-acoustic-wave filter has filter composition which generally becomes the circuit of unbalance-unbalance, and is adjusted by 50 ohms. Moreover, when outputting and inputting by unbalance connection in a high impedance circuit, the impedance by the side of a device circuit was greatly different, and the mismatch loss was large.
[0003] However, it can respond to I/O of an unbalance-balance or balanced - balance, impedances differ by I/O further, and the surface-acoustic-wave filter with the small mismatch loss of a device and a circuit is called for in recent years.
[0004]
[Problem(s) to be Solved by the Invention] In order to meet the demand of the equilibration of a circuit, if it usually becomes, the balun which performs conversion to the balance from unbalance or conversion to unbalance from a balance will be used. However, when a balun is used, it is a problem in respect of circuit area or cost.
[0005] In recent years, the case of the surface-acoustic-wave filter for mobile communications where it is used for low-loss-izing where a circuit and adjustment are taken is increasing, and conversion not only to the circuit adjusted by further usual 50 ohms but the impedance which is different from 50ohms may have to be performed simultaneously.
[0006] The purpose of this invention is offering the surface-acoustic-wave filter which can have consistency with an impedance including an unbalance input/output terminal, without extending chip area (without enlarging device size).
[0007]
[Means for Solving the Problem] the piezo-electric substrate used in order to acquire the property of a surface-acoustic-wave filter with desired bandwidth -- an electrode -- a logarithm and intersection width of face are restricted the case of the filter corresponding to a balanced type circuit -- an electrode -- it is difficult to change a logarithm and intersection width of face sharply
[0008] When making the impedance of I/O into a different value in this invention, the 1st step blind-like electrode group and 2nd step blind-like electrode group which were formed on the same substrate are connected electrically. Each portion made into 2 or more ****s in some [at least] blind-like electrodes or a blind-like electrode in two or more blind-like electrodes which form an input or an output blind-like electrode group by carrying out cascade connection The impedance of a single-sided (an output, input)

terminal was changed without changing a logarithm and intersection width of face so much, and adjustment was made possible with the external circuit. This uses that-izing of the I/O impedance can be carried out [a high impedance], without changing the excitation intensity of a surface acoustic wave by cascade connection.

[0009] Thereby, the surface-acoustic-wave filter corresponding to the circuit of balanced - unbalance with the good out-of-band magnitude of attenuation or balanced - balance with the small insertion loss by the mismatch can be obtained.

[0010]

[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. The circuit diagram of the surface-acoustic-wave filter which drawing 1 requires for the gestalt of the 1st operation, and drawing 2 are the circuit diagrams of the surface-acoustic-wave filter concerning the gestalt of the 2nd operation.

[0011] In drawing 1 and drawing 2 a surface-acoustic-wave filter 64-degree rotation Y-axis cut X-axis propagation lithium niobate is used as a piezo-electric substrate. 1st step blind-like electrode group 1a, 2nd step blind-like electrode group 1b, the 1st step blind-like electrode group output blind-like electrodes 2a, 5a, and 6a, The 2nd step blind-like electrode group input blind-like electrodes 2b, 5b, and 6b, the 1st step blind-like electrode group input blind-like electrodes 3a and 4a, The 2nd step blind-like electrode group output blind-like electrodes 3b and 4b, the grating reflectors 7a, 8a, 7b, and 8b, It has the 1st step blind-like electrode group input pads 9a, 10a, 11a, and 12a, the 2nd step blind-like electrode group output pads 9b, 10b, 11b, and 12b, input terminals 13a and 13b, and output terminals 13b and 14b.

[0012] It designs to 50 ohms of I/O by unbalance-unbalance, and the output pads 10b and 11b are connected with concatenation with a wire like drawing 1 . By 1st step blind-like electrode group 1a, the 1st step blind-like electrode group input blind-like electrodes 3a and 4a become parallel connection now, and the 2nd step blind-like electrode group output blind-like electrodes 3b and 4b serve as a series connection in 2nd step blind-like electrode group 1b. The impedance seen from output terminals 13b and 14b by this was able to carry out by about 4 times the impedance seen from input terminals 13a and 14a. That is, an input side can be set to 50 ohms and an output side can be set to 200 ohms.

[0013] Moreover, like drawing 2 , 180 degrees 2nd step blind-like electrode group output blind-like electrode 3b can be reversed to propagation, and the impedance similarly seen from output terminals 13b and 14b can carry out by about 4 times the impedance seen from input terminals 13a and 14a by connecting the output pads 10b and 11b with concatenation by the electrode pattern.

[0014] In order to make an input side into unbalance at this time in any case, one input terminal 14a of input terminals 13a and 14a is grounded, and the balanced output of the input signal impressed from another input terminal 13a is carried out from two output terminals 13b and 14b. In the time of balanced ON appearance, since it becomes symmetrical electrically to an electric terminal, there is an effect of reduction of an insertion loss with the 1st and 2nd operation gestalt.

[0015] The circuit diagram of the surface-acoustic-wave filter which drawing 3 requires for the gestalt of the 3rd operation, and drawing 4 are the circuit diagrams of the surface-acoustic-wave filter concerning the gestalt of the 4th operation.

[0016] In drawing 3 and drawing 4 , a surface-acoustic-wave filter like the gestalt of the 1st and the 2nd operation shown in drawing 1 and drawing 2 64-degree rotation Y-axis cut X-axis propagation lithium niobate is used as a piezo-electric substrate. 1st step blind-like electrode group 1a, 2nd step blind-like electrode group 1b, the 1st step blind-like electrode group output blind-like electrodes 2a, 5a, and 6a, The 2nd step blind-like electrode group input blind-like electrodes 2b, 5b, and 6b, the 1st step blind-like electrode group input blind-like electrodes 3a and 4a, The 2nd step blind-like electrode group output blind-like electrodes 3b and 4b, the grating reflectors 7a, 8a, 7b, and 8b, It has the 1st step blind-like electrode group input pads 9a, 10a, 11a, and 12a, the 2nd step blind-like electrode group output pads 9b, 10b, 11b, and 12b, input terminals 13a and 13b, and output terminals 13b and 14b.

[0017] It designs to 50 ohms of I/O by unbalance-unbalance, and like drawing 3 , the intersection width of face of the 2nd step blind-like electrode group output blind-like electrodes 3b and 4b is divided into

two, and it ties to concatenation. By 1st step blind-like electrode group 1a, the 1st step blind-like electrode group input blind-like electrodes 3a and 4a become parallel connection now, and the 2nd step blind-like electrode group output blind-like electrodes 3b and 4b serve as a series connection in 2nd step blind-like electrode group 1b. The impedance seen from output terminals 13b and 14b by this was able to carry out by about 4 times the impedance seen from input terminals 13a and 14a. That is, an input side can be set to 50 ohms and an output side can be set to 200 ohms.

[0018] Moreover, the impedance seen from output terminals 13b and 14b can carry out by about 4 times the impedance seen from input terminals 13a and 14a by dividing the logarithm of the 2nd step blind-like electrode group output blind-like electrodes 3b and 4b into two, and tying to concatenation like drawing 4 . And it becomes the composition which does not need the further electric leading about.

[0019] In order to make an input side into unbalance at this time also in the method of what, one input terminal 14a of input terminals 13a and 14a is grounded, and the balanced output of the input signal impressed from another input terminal 13a is carried out from two output terminals 13b and 14b. since it becomes symmetrical electrically to an electric terminal in the time of balanced ON appearance -- the 3rd and 4th operation gestalt -- an electrode -- design flexibility, such as a logarithm and intersection width of face, is large, and there is an effect of reduction of an insertion loss

[0020] Moreover, this invention of be [it / what is limited to the above-mentioned operation gestalt] is clear. That is, although it designed with four operation gestalten so that it might become 200 ohms of outputs in 50 ohms of inputs, it is also possible to change the impedance of I/O into 100 ohms or 150 ohms by this invention, and it is also easy to make it the composition of balanced - balance.

[0021]

[Effect of the Invention] As explained above, an I/O impedance can be changed preventing degradation of a property in equivalent chip area compared with the case of unbalance-unbalance according to this invention, and the surface-acoustic-wave filter which can respond to a balanced circuit can be obtained.

[Translation done.]